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According to Prevention of Food Adulteration Act 1954 [as modified upto 1st August 1962 (India)] mixing of pesticides with food grains is prohibited and thus illegal. Therefore the problem of safe storage of food grains has to be solved by the use of better storage structures rather than by the use of pesticides. In this respect the Pusa Bin developed in the Division of Entomology of I.A.R.I. is very simple and cheap structure which has given very good results and can be safely depended upon.

A campaign for the control of a number of pests with a view to increase production of the present 'rabi' crops is being undertaken on a large scale. For this purpose special pamphlets containing details supplied by the Indian Agricultural Research Institute, New Delhi, have been printed. The readers of the Entomologists' Newsletter may be interested in the contents of these pamphlets which are practically reproduced below :

Increase the Yield of Barley by Destroying the Aphid Pest

Aphids cause appreciable damage to barley crop. Although the damage is slow but it is continuous and may often reduce the yield by 25 per cent. Effective control measures can hence help to enhance the yield of barley substantially.

Nearly all the varieties of barley grown in our country are susceptible to aphids. The best way to control this pest is to use the insecticides as indicated below :

<i>Insecticide</i>	<i>Per cent strength of insecticide</i>	<i>Dilution in 1000 litres of water</i>	<i>Per cent increase in yield</i>
Methylparathion			
50 EC	0.05	1 litre	28
Fenitrothion			
50 EC	0.05	1 litre	25
Endosulfan			
35 EC	0.053	1.5 litre	24
Methyldemeton			
25 EC	0.025	1 litre	24
Lindane			
20 EC	0.03	1.5 litre	23
Diazinon			
20 EC	0.032	1.6 litre	21
Dimethoate			
30 EC	0.023	0.75 litre	20
Malathion			
50 EC	0.125	2.5 litre	19

Spray any of these insecticides depending upon their availability, market price and relative increase in yield shown in the above table.

Time of Application : Aphids usually appear from middle of January to end of January depending upon the temperature in different regions. The warmer winter encourages the infestation earlier. Give the first spray as soon as the aphid population begins to build-up on the crop. The exact time of application of the insecticide may be decided in consultation with the local plant protection workers. Give the second spray after two weeks of the first one. Usually two sprays are sufficient.

Method of application : These insecticides are available as emulsifiable concentrates and should be diluted with water to prepare the spray emulsion. 1000 litres of the spray emulsion will be sufficient for one hectare of the crop. The quantity of the insecticide and the amount of water needed for preparing the spray emulsion of the required strength are given in the above table.

For getting good results, it is essential to use the insecticide of proper strength. To prepare the ready-to-use spray emulsion see the following example. On this basis, emulsion of the required strength of any of the insecticides can be obtained.

In order to prepare spray emulsion of methylparathion of 0.05 per cent strength, mix one litre (1000 ml) of the insecticide (50 EC) in 1000 litres of water. For actual spraying the emulsions are not prepared in such large quantities but in smaller quantities like 50 or 100 litres. The quantity of the insecticide (EC) can be changed in the same proportion.

Stir the emulsion thoroughly for proper mixing. Keep it well stirred through out the spraying operation.

Increase Your Mustard Production by Aphid Control

The damage caused by the aphid pest to mustard crop is often so high that an increase in yield of about ten times higher than the untreated plot can be brought about by controlling this pest. Therefore, under proper pest management, a cultivator can make a

net profit of more than Rs. 1300* per hectare by spending about Rs. 250.

In Northern India, the mustard aphid causes such a severe damage to the mustard crop that the cultivators in Delhi and adjoining areas do not grow a pure crop of mustard. The tiny aphids appear in large numbers on mustard crop during December, January and February. This year, (1971) already in the Karnal District of Haryana, several farmers have ploughed in the standing mustard crop owing to the severe damage caused by aphids.

The mustard aphid is a small green insect, about 2 mm in size and is locally known by various names like mustard 'bindi' or lice, 'tela', 'lai', 'mahoo', 'pelu', 'chepe' etc., in the different states. Aphids have piercing and sucking mouth parts, which resemble a hypodermic syringe. They use the syringe effectively by piercing plant tissues, especially the leaves, tender shoots, flowers and grains in the milky stage and suck the sap from the various parts of the plant. They also secrete a sweet liquid called 'honey dew' which attracts black ants, which feed on this material and transport them from place to place, thus helping them invade crops in new areas.

This pest has a tremendous capacity to reproduce even without mating. Within a matter of days they can form hundreds of colonies, each consisting of thousands of individuals. One can very well imagine the fate of the plants, with thousands of these insects continuously sucking the vital nutrients from them. The plants wither away, flowers drop down, and pods and grains get shrivelled. Consequently the yield is so much reduced that as earlier mentioned it becomes uneconomical to grow this crop.

Studies have shown that the mustard crop can be grown successfully and the aphids can be controlled by spraying the crop with 0.1 per cent gamma BHC at an interval of 20-30 days depending on the rate at which the aphid population builds up in a particular season. The economics of the above pest control operations has been worked out. The cost of three insecticidal sprays with 0.1% gamma BHC worked out to be Rs. 245 per hectare and the yield obtained from the treated plots was 1020 kg against in the untreated control 92 kg per hectare. The cultivator, thus, can make a net profit of

*Calculated on the price of mustard @ Rs. 170 per quintal and gamma BHC @ Rs. 13 per litre.

about Rs. 1300 per hectare by spending about Rs. 250. It has been further observed that the seeds obtained from the treated plots are plump and bigger in size, while the seeds from the untreated plots are small and shrivelled. The oil yields worked out to be 408 kg and 24.5 kg per hectare from the treated and untreated crops respectively.

Insecticide : Gamma BHC 20 EC About 16 litres for spraying one hectare of mustard crop, thrice in the season.

Preparation of Spray Fluid : Gamma BHC is available in the market in the form of 20 per cent emulsion concentrate. For preparing 0.1 per cent spray fluid add 5 ml of 20 per cent gamma BHC in one litre of water.

The above mentioned recommendation is considered to be the best in the light of the work carried out at the I. A. R. I. However, several recommendations have also been made by different states and the local plant protection officers in Entomology, should feel free to make any variation which they may find necessary in view of their own local experience. What is important is that immediate steps should be taken to increase the production of various kinds of mustard substantially by controlling aphids, in order to augment the supply of vegetable oils.

Pest Control Would Help Increase Gram Production

The acreage under Bengal gram in the border states of Rajasthan, Haryana and Punjab constitutes about 36% of the total area under this crop in the country. The production of this very important pulse in these three states is about 40% of the total gram production. The average gram yield in Haryana and Punjab is relatively high being 10.7 and 9 quintals per hectare respectively, as against the all India average of 7.2 quintals per hectare. Gram is also extensively cultivated in Uttar Pradesh, Madhya Pradesh and also in large areas of Bihar and Bengal in the north and in Mysore in the south.

Gram's contribution to nutrition is well known and at a time when our people should get more nutritious food to work harder, the importance of increasing the production of the standing crop is

obvious. Bengal gram is often seriously damaged by the gram caterpillar or the pod borer, *Heliothis armigera* during January to March when the crop is in the fruiting stage. The caterpillar not only defoliates the tender parts but also bores the green pods and feeds upon the ripening grains. While feeding on the seeds, it is generally found with its anterior body portion inside the pod it attacks, and the posterior half remains exposed. Unless this pest is controlled in the initial stages of infestation, it reduces the yield considerably.

Recent studies undertaken at the I. A. R. I. have revealed that as a result of chemical treatment the pest could be effectively controlled and an increase of 40% in the yield could be achieved even under conditions of mild infestation. The increase in yield brought about by various treatments in studies at the I.A.R.I. is shown below.

<i>Treatment</i>	<i>Per cent increase in yield over untreated crop</i>
1. Endosulfan (0.07%)	40
2. DDT (0.25%) + Endosulfan (0.07%)	25
3. Lindane (0.1%)	19
4. DDT (0.02%)	18
5. Diazinon (0.05%)	11

Thus, it is clear that the yield of gram crop now in the field can be appreciably increased by pest control. The insecticides tested are commonly available in the country. Every precaution should, hence, be taken to treat the crop in the initial stage of the pest infestation.

The insecticide is to be applied at fruiting stage when the crop is most vulnerable to the pest attack. Normally, one timely application of chemical treatment suffices ; otherwise it may be repeated at 10 day interval.

Availability of insecticides : DDT and Lindane are available from a number of firms. Endosulfan is marketed as Thiodan 35 EC by M/s Hoechst Pharmaceuticals Ltd. Diazinon is marketed as Basudin 20 EC by M/s Rallis India Ltd.

Concentration of insecticides

2 cc of Thiodan 35 EC + 1 litre of water
10 cc of DDT 25% EC + 1 litre of water
5 cc of Lindane 20 EC + 1 litre of water
2.5 cc of Basudin 20 EC + 1 litre of water

Dosage : 500 litres of insecticide emulsion will be required for one hectare.

As regards the selection of the insecticide, it should depend upon the availability, market price and the yield increases shown above. Also several recommendations have been made by different states and the local plant protection specialists and entomologists should feel free to make any variations which they might find necessary in view of their own local experience.

Another pest which becomes serious at present stage of the crop is cutworm (*Agrotis spp.*). The caterpillars cut the young plants and branches. This pest is often very serious in certain pockets of Bihar, U.P., and Madhya Pradesh. BHC dust (10%) raked into the soil has been reported to give good control in a number of states.

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